April 7, 2003

Subject: **Amendment No. 1 to Letter of Interest No. RAT-3-33624 entitled "Phase 1B: High Performance PV–Exploring and Accelerating Ultimate Pathways"**

Questions/Answers

The following information is provided in response to questions received regarding the subject LOI solicitation:

1. **Question**: It is our understanding that the project would need solar concentrators that focus high intensity sunlight on a high-efficiency PV. We have developed a solar concentrator that can focus concentrated solar energy at high efficiency onto a target. In this case, the target would be a PV device. We are not developing photovoltaics. Would our solar concentrator fit into RAT-3-33624?

   Answer: The answer is provided on page four of the solicitation for LOIs: "**Achievement of a 40% cell is no guarantee of a 33% module: integration of the cell into the module cannot be disregarded. Examples of issues in this area include losses associated with the optics or increased cell temperature, flux non-uniformity (including chromatic aberrations), cell protection, mounting and interconnect bonding, passivation of cell interconnects, development of secondary optics materials, heat sinking, and cell degradation/reliability issues. Progress in all of these areas may be facilitated by development of models and the associated computational resources**".

2. **Question**: The Solicitation refers to this as "Phase 1B". Does this mean that we must have already completed Phase 1 in order to apply to Phase 1B?

   Answer: No.

3. **Question**: Can an organization be a subcontractor on one LOI, and the prime on another for a given category?

   Answer: Yes, see page five, section six of the solicitation for LOI.

4. **Question**: Will proposals targeting thin films on crystalline Si wafers be considered for Category A? For example: thin film Si on ribbon Si wafers. If so, is there a limitation on the thickness of the wafers?

Answer: The answer is provided on page 4 of the solicitation for LOIs: "The approaches may include modified processing and control of electronic properties of I-III-VI_ and II-VI alloy materials, and other novel absorber materials. Letters of Interest may include combinations of these approaches, specific aspects of them, or even new ideas that are not included here, as long as they are aimed at the long-term project goals".

5. Question: The solicitation says each "responder" can only submit one proposal in each of the two categories. Is a responder an individual or an institution. For example, does this mean that a University could only submit one proposal in each category, or that a University could submit multiple proposals, but an individual principal investigator, could only submit one in each category?

Answer: In the case of Universities, the University could submit multiple proposals with separate PI's identified. Individual PI's would be limited to one submittal per category.

6. Question: We have embarked on an extensive research effort regarding the formation and characterization of epitaxial single crystal alloys of In1-xGaxN films for use in advanced solar cell applications. Would this more basic research oriented work fall under the mentioned call for proposals?

Answer: The answer is provided on page 4 of the solicitation for LOIs: "Fundamental R&D in the cell area is needed to develop new materials and/or structures as well as perfect the quality of the materials. The responder may address, but is not limited to, R&D towards a 40% efficient device on any of the following device structures: mechanical, lattice-matched, monolithic integrated, wafer-bonded, and smart-cut approaches".

7. Questions:
a) How are results from Phase 1A accessed?
b) On page 3 it says that "..., thin Si and other novel approaches

should be considered for the bottom cell." Is polycrystalline silicon of the type associated with ribbon growth (String Ribbon, for example) acceptable as a substrate?

c) Most of the document speaks to tandem cells. Is a Hetero structure an acceptable topic (like the Sanyo HIT cell)?

d) Can a proposer propose to investigate two ideas and down select to one idea mid way through the program?

e) Can a University be the prime and subcontractor to a company?

f) We have an idea for band-gap engineering of silicon-based wafers. The result would be a homo-junction solar cell, but of higher efficiency than just silicon. In a practical sense I would expect polycrystalline material to jump from, say 15% to 19-20% efficiency, without major changes in cell fabrication. Is this a suitable topic?

Answers:

a) The NREL Project Manager (or other NREL staff) may provide the High Performance PV external website URL where public domain report deliverables resulting from the Phase 1A activities have been posted–if they have been posted. The RFP includes a foot note [1] that references the U.S. Photovoltaics Industry Roadmap at the URL: www.nrel.gov/ncpv/pdfs/30150/pdf. However, this site may not include the public domain report deliverables from Phase 1A that are being requested and may not include suggested or intuitive links to an NREL Internet site where the public domain report deliverables from Phase 1A are available.

In addition, the electronic reporting requirements for all subcontracts are identified in NREL's standard subcontract terms and conditions. The purpose of these reporting requirements is to ensure that all public domain scientific and technical information, including report deliverables are delivered to the United States Department of Energy's Office of Science and Technical Information. The URL for OSTI is: http://www.osti.gov/. The NREL Project Manager (or other NREL staff) may provide a list of the Phase 1A public domain report deliverables so that those parties interested in obtaining the public domain report deliverables from OSTI will be able to request copies of specific reports by title and may elect to request only those report deliverables for either of the two technical categories, A or B.

b) The answer is on page three and four of the solicitation for LOIs:, "thin Si and other novel approaches should be considered for the bottom cell."

c) **The answer is on page four of the solicitation for LOIs:, "With a monolithic configuration and/or possible alternative device structures and approaches……"**

d) **There are no restrictions as to the number of R&D technologies that can be proposed under one LOI. All LOIs will be evaluated in accordance with the qualitative merit criteria for best value selection (page 6, section 9).**

e) **Yes, a university can be a lead responder as well as a low-tier subcontractor for another submitted LOI.**

f) **The answer is on page four of the solicitation for LOIs: "The responder may address, but is not limited to, R&D towards a 40% efficient device on any of the following device structures: mechanical, lattice-matched, monolithic integrated, wafer-bonded, and smart-cut approaches".**

8. **Question:** **Is the term "cost reimbursable" indicating that the awardee would have to pay for the research in advance and ask for reimbursement afterward?**

Answer **Yes. Under cost reimbursable subcontracts, a subcontractor would invoice for actual costs previously incurred.**

9. **Question:** **The document emphasizes the development of the top cell (e.g. how to get beyond the 1.45 eV barrier) to achieve higher efficiency at higher bandgaps. Would you prefer a system-level approach where we would study the tandem cell as a whole and address the top cell, bottom cell, and the interface? Is there any particular balance between the three that you would prefer? Along these same lines, should the proposed effort involve a team we assemble to look at the whole device, or should we only propose one aspect of the problem?**

Answers: **a)** **The answer is on page three and four of the solicitation for LOIs.**

b) **There are no restrictions as to the number of R&D technologies that can be proposed under one LOI. All**

LOIs will be evaluated in accordance with the qualitative merit criteria for best value selection (page 6, section 9).

10. Question: Is there a phase 2 possible with this effort? It does not appear that it is called out specifically, but the existing HiPer program has two phases.

Answer: This solicitation for LOI addresses Phase IB: High Performance PV–Exploring and Accelerating Ultimate Pathways.

11. Question: Is a flexible tandem cell desirable and/or necessary for this effort?

Answer: The answer to the question is on page 4, section 5 of the solicitation for LOI.

12. Question: Are process control and/or sensor investigations of interest in this solicitation?

Answer: The answer to the question is on page 4, section 5 of the solicitation for LOI.